

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**

IN THE CLAIMS:

Please amend the following claims:

1. (Currently Amended) A method for plating metal on a substrate, comprising:
providing a plating solution comprising:
metal ions;
an acid;
halide ions;
one or more organic additives configured to enhance one or more plating characteristics; and
an at least one anti-oxidant selected from the group consisting of sodium stannate, hydroquinone, butylated hydroxy toluene, and combinations thereof, wherein the anti-oxidant has a concentration between about 500 ppm and about 5000 ppm; and
contacting a substrate having an electrical bias applied thereto with the plating solution to deposit a metal thereon.
- 2-3. (Cancelled)
4. (Previously Presented) The method of claim 1, wherein the metal ions comprise copper ions in a concentration of between about 5 g/L and about 100 g/L.
5. (Previously Presented) The method of claim 1, wherein the acid has a concentration of between about 5 g/L and about 200 g/L.
6. (Previously Presented) The method of claim 1, wherein the halide ions comprise chloride ions in a concentration of between about 10 ppm and about 200 ppm.
7. (Original) The method of claim 1, wherein the amount of anti-oxidant added into the plating solution per unit time is calculated to correspond to an amount of organic additives degrading in the plating solution per unit time.

8. (Previously Presented) The method of claim 1, wherein the plating solution comprises:

copper ions at a concentration of between about 5 g/L and about 100 g/L;
the acid at a concentration of between about 5 g/L and about 200 g/L;
chloride ions at a concentration of between about 10 ppm and about 200 ppm;
sodium stannate at a concentration of between about 500 ppm and about 5000 ppm; and

at least one organic plating additive configured to enhance a plating characteristic of copper plating on the substrate.

9. (Previously Presented) The method of claim 8, wherein the at least one organic plating additive comprise at least one of a leveler, a suppressor, and an accelerator.

10. (Original) The method of claim 1, further comprising:
disposing of the entire plating solution after a period of time; and
replacing the plating solution.

11. (Previously Presented) A method for plating metal on a substrate, comprising:
disposing the substrate and an anode in a plating solution, the plating solution comprising:

metal ions;
an acid;
halide ions;
one or more organic additives configured to enhance one or more plating characteristics; and

at least one anti-oxidant selected from the group consisting of sodium stannate, hydroquinone, butylated hydroxy toluene, and combinations thereof having a concentration between about 500 ppm and about 5000 ppm; and
electroplating the metal ions from the plating solution onto the substrate.

12. (Original) The method of claim 11, further comprising:

disposing of the entire plating solution after a period of time; and
replacing the plating solution.

13. (Previously Presented) The method of claim 11, wherein the metal ions comprise copper ions.

14. (Currently Amended) The method of claim 11, wherein the metal ions comprise copper ions in a concentration of between about 5 g/L and about 100 g/L.

15. (Cancelled)

16. (Previously Presented) The method of claim 11, wherein the at least one anti-oxidant is sodium stannate at a concentration of between about 500 ppm and about 5000 ppm.

17. (Previously Presented) The method of claim 16, wherein the halide ions comprise chloride ions at a concentration of between about 10 ppm and about 200 ppm.

18. (Currently Amended) The method of claim 16, wherein the acid has at a concentration of between about 5 g/L and about 500 g/L.

19. (Previously Presented) The method of claim 11, wherein the plating solution comprises:

copper ions at a concentration of between about 5 g/L and about 100 g/L;

the acid at a concentration of between about 5 g/L and about 200 g/L;

chloride ions at a concentration of between about 10 ppm and about 200 ppm;

and

sodium stannate at a concentration of between about 500 ppm and about 5000 ppm.

20. (Previously Presented) A plating solution for an electrochemical plating system, comprising:

a liquid solution containing copper ions to be plated on a substrate;

an acid;

halide ions;

at least one organic plating additive configured to facilitate a plating characteristic of the copper ions onto the substrate; and

at least one anti-oxidant selected from the group consisting of sodium stannate, hydroquinone, butylated hydroxy toluene, and combinations thereof, wherein the anti-oxidant has a concentration between about 500 ppm and about 5000 ppm.

21. (Original) The plating solution of claim 20, wherein the liquid solution comprises copper sulfate.

22. (Original) The plating solution of claim 20, wherein the copper ions are at a concentration of between about 5 g/L and about 100 g/L.

23. (Previously Presented) The plating solution of claim 22, wherein the acid has a concentration of between about 5 g/L and about 200 g/L.

24. (Previously Presented) The plating solution of claim 22, wherein the halide ions comprise chloride ions at a concentration of between about 10 ppm and about 200 ppm.

25. (Cancelled)

26. (Original) The plating solution of claim 22, wherein the anti-oxidant is sodium stannate at a concentration of between about 500 ppm and about 5000 ppm.

27. (Previously Presented) The plating solution of claim 20, further comprising:
the copper ions at a concentration of between about 5 g/L and about 100 g/L;
the acid solution at a concentration of between about 5 g/L and about 200 g/L;

chloride ions at a concentration of between about 10 ppm and about 200 ppm;
and

sodium stannate at a concentration of between about 500 ppm and about 5000 ppm.

28. (Original) The plating solution of claim 20, wherein the at least one organic plating additive comprises at least one of a suppressor, leveler, and an accelerator.

29. (Currently Amended) A method for reducing ~~degraded~~ degradation of organic plating additives in an electrochemical plating solution, comprising adding sodium stannate to the electrochemical plating solution, the sodium stannate being added in an amount corresponding to a time varying amount of degraded organic plating additives generated in the electrochemical plating solution.

30. (Original) The method of claim 29, wherein a concentration of the sodium stannate is between about 500 ppm and about 5000 ppm.

31. (Original) The method of claim 29, wherein the electrochemical plating solution is configured to plate copper.

32. (Original) The method of claim 31, wherein the electrochemical plating solution includes copper ions in a concentration of between about 5 g/L and about 100 g/L.

33. (Original) The method of claim 31, wherein the electrochemical plating solution includes an acid in a concentration of between about 5 g/L and about 200 g/L.

34. (Original) The method of claim 31, wherein the plating solution includes chloride ions in a concentration of between about 10 ppm and about 200 ppm.

35-40. (Cancelled)